

WE CLAIM:

1. A method of allocating queues in a network device,  
the method comprising:
  - 5 making a classification for an incoming packet;  
determining whether a queue has already been  
allocated for the classification; and  
allocating the queue when the queue has not already  
been allocated for the classification.
- 10 2. The method of claim 1, wherein the queue is  
associated with an ingress port of the network device.
3. The method of claim 1, wherein the queue is a  
15 virtual output queue.
4. The method of claim 1, further comprising:  
detecting when a queue is empty; and  
de-allocating the empty queue.
- 20 5. The method of claim 1, wherein the queue is  
associated with an ingress port.
6. The method of claim 1, wherein the classification is  
25 based on a packet source, a packet destination or a  
packet priority.
7. The method of claim 1, wherein the classification  
comprises a Q number.
- 30 8. The method of claim 1, wherein the determining step  
comprises addressing a memory that indicates whether the  
classification has already been allocated a queue.

9. The method of claim 4, further comprising updating a memory when a queue is de-allocated, wherein the memory indicates whether the classification has already been allocated a queue.

5

10. The method of claim 4, wherein the network device further comprises a free list that indicates queues available for allocation and wherein the method further comprises updating the free list when a queue is de-

10 allocated.

11. A network device, comprising:

means for making a classification for an incoming packet;

15 means for determining whether a queue has already been allocated for the classification; and

means for allocating the queue when the queue has not already been allocated for the classification.

20 12. The network device of claim 11, wherein the queue is associated with an ingress port of the network device.

13. The network device of claim 11, wherein the queue is a virtual output queue.

25

14. The network device of claim 11, further comprising:

means for detecting when a queue is empty; and

means for de-allocating the empty queue.

30 15. The network device of claim 11, wherein the queue is associated with an ingress port.

16. The network device of claim 11, wherein the classification is based on a packet source, a packet destination or a packet priority.

5 17. The network device of claim 11, wherein the classification comprises a Q number.

18. The network device of claim 11, wherein the determining means comprises means for addressing a memory  
10 that indicates whether the classification has already been allocated a queue.

19. The network device of claim 14, further comprising means for updating a memory when a queue is de-allocated,  
15 wherein the memory indicates whether the classification has already been allocated a queue.

20. The network device of claim 14, wherein the network device further comprises a free list that indicates  
20 queues available for allocation.

21. The network device of claim 20, further comprising means for updating the free list when a queue is de-allocated.

25

22. A computer program embodied in a machine-readable medium, the computer program configured to control a network device to perform steps comprising:

making a classification for an incoming packet;  
30 determining whether a queue has already been allocated for the classification; and  
allocating the queue when the queue has not already been allocated for the classification.

23. A network device, comprising:  
a plurality of ports configured to receive incoming packets;  
5 a classification engine for making classifications for incoming packets;  
a memory that indicates whether a queue has already been allocated for a classification; and  
a processor for allocating the queue when the memory  
10 indicates that a queue has not already been allocated for the classification.
24. The network device of claim 23, wherein the memory is a content addressable memory.
- 15 25. The network device of claim 23, wherein the memory is a random access memory.
26. A method of allocating queues in a network device,  
20 the method comprising:  
having no queues allocated at a first time;  
receiving a first packet;  
making a first classification for the first packet;  
allocating a first queue for the first  
25 classification;  
receiving a second packet;  
making a second classification for the second packet; and  
determining whether the first classification is the  
30 same as the second classification.
27. The method of claim 26, further comprising the step of allocating a second queue when the first

classification is different from the second classification.

28. The method of claim 26, further comprising the step  
5 of assigning the second packet to the first queue when  
the first classification is not different from the second  
classification.

29. A method of allocating queues in a network device,  
10 the method comprising:  
determining a first number of packets that an  
ingress port of the network device can receive; and  
allocating a second number of physical queues for  
the ingress port, wherein the second number is less than  
15 or equal to the first number.

30. The method of claim 29, wherein the network device  
operates according to the Fibre Channel protocol and  
wherein the determining step is based on a number of  
20 buffer-to-buffer credits granted by the ingress port.

31. The method of claim 29, further comprising:  
identifying a category for each packet arriving at  
the ingress port;  
25 correlating the category to an existing physical  
queue; and  
storing packet information in the physical queue.

32. The method of claim 29, further comprising:  
30 identifying a category for each packet arriving at  
the ingress port; and  
assigning the category to a physical queue, wherein  
the network device allocates a new physical queue only

when there is no existing physical queue for the category.

33. The network device of claim 31, wherein the packet  
5 information comprises control information selected from  
the list consisting of destination information, source  
information, priority information, payload type  
information and payload size information.

10